



SENR Impact

2019 & 2020



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES



Preparing Students through Experiential Learning in Five SENR Majors

(EEDS: Environment, Economy, Development and Sustainability;
EPDM: Environmental Policy and Decision Making;
ES: Environmental Science; FFW: Forestry, Fisheries and Wildlife;
NRM: Natural Resource Management)

Impact Statement 2019

INVESTIGATORS

Alia Dietsch, Matt Hamilton, Greg Hitzhusen, David Hix, Gabe Karns, Chris Tonra, Bill Peterman, Suzanne Gray, Matt Davies, Joseph Campbell

SUMMARY

One of the most dynamic ways SENR prepares students for careers and graduate study is to engage them in experiential learning activities that help students integrate the concepts and skills they have gained in the classroom. Our main venues for experiential learning are capstone courses, internships, and field-based studies, all of which have seen notable success in 2019. These programs simultaneously fulfill the teaching, research, and outreach missions of the School.



SITUATION

A growing body of research demonstrates that hands-on experiences in which students apply theoretical ideas to real world situations is important to their learning process. Employers indicate that they want college graduates to have more practical experience in collaborative, multi-disciplinary teams addressing real-world problems as a way to transition students from their formal studies into successful careers, and research shows that the first job of over 50% of students after graduation is a direct result of an internship. Historically, environment and natural resources curricula have capitalized on opportunities to use outdoor settings to expose students to natural landscapes and systems, and to interact with professional natural resource managers. The complexity of contemporary sustainability challenges also invites integrative, experiential study which benefits from the immersive, real-world experiences provided by capstone courses, internships, and field study courses.



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RESPONSE

Each of the five SENR majors includes experiential learning options designed to solidify ideas, concepts and tools learned in the classroom. In 2019 we led several capstone courses where student teams collaborated with community partners. EEDS majors worked with city and staff at Ohio State to evaluate sustainable transportation, energy, and waste campaigns. FFW and NRM students collaborated with Columbus and Franklin County Metro Parks, City of Columbus Recreation and Parks Department, and Ohio State Mansfield. ESS and EPDM students designed restoration proposals to align the Campus landscape with Ohio State's Sustainability Goals, and EPDM majors partnered with Columbus and Westerville to tackle water quality issues. We also offered a suite of field studies courses with hands-on application of concepts that enhanced experiential learning, including Taxonomy and Behavior of Fishes, Forest Ecosystems, Avian Wildlife Biology and Management, Wildlife Ecology Methods, and Ecosystem Restoration.



IMPACT

Capstone student projects contributed directly to improved ecosystem management by empowering local residents and informing local decision-makers. Specifically, our EEDS capstone projects continued to help local people, businesses, and public officials navigate a range of complex sustainability challenges. Our FFW/NRM capstone projects facilitated bioblitz and water quality events at Whetstone Park of Roses for Earth Day; assessed avian and aquatic diversity, invasive species management, and forest restoration efforts at Scioto Grove Metro Park; assisted other Columbus park properties with habitat management and restoration plans; collected data on silvicultural demonstration areas; and partnered to implement a maple syrup forest stand at Ohio State Mansfield. Our EPDM capstone students designed lesson plans, outreach programs, and stakeholder engagement strategies to improve collaboration and environmental problem-solving, in partnership with the City of Columbus Department of Utilities and the City of Westerville. Additionally, our Practical Skills for Terrestrial Ecosystem Restoration course provided 50 students with Ohio Department of Agriculture pesticide licensing and Ohio Forestry Association chain-saw qualifications; they also contributed to restoration of 5+ acres of the Ohio State campus through removal of invasive species, woodland creation and prairie restoration. Our capstone courses, internships, and field-based studies facilitated student career success, as evidenced by an 88% job placement rate for recent SENR graduates.

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Preparing the Next Generation of Scientists: Expanded Opportunities for Undergraduate Research

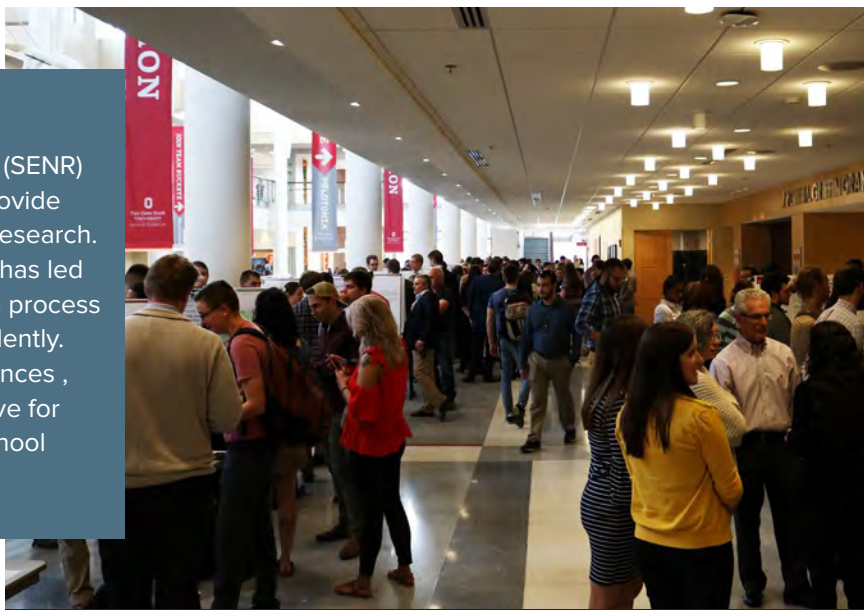
Impact Statement 2019

INVESTIGATORS

Lauren Pintor, Brian Lower, Renee Johnston, Nicole Jackson, Bill Peterman and the staff and students of the School of Environment & Natural Resources (SENR)

SUMMARY

The School of Environment and Natural Resources (SENR) Honors and Undergraduate Research Programs provide support for undergraduates to conduct mentored research. Our focus on hands-on, student-centered learning has led to gains in students' understanding of the research process and ability to conduct research and work independently. Our students regularly present research at conferences, coauthor journal articles, and have been competitive for jobs, scholarship and fellowships, and graduate school applications in STEM disciplines.



Environmental Professionals Network of SENR provides opportunities for students to showcase their scholarly research.

SITUATION

The 21st century economy demands higher levels of technical and scientific training and employers and graduate schools increasingly expect undergraduates to have **hands-on experience** designing, conducting, and synthesizing research. This is particularly true in environmental and natural resource management, where expertise from multiple disciplines is required to provide science-based solutions to complex problems. The applied and **interdisciplinary** research focus of SENR faculty and staff provide unique opportunities to engage undergraduates in a wide range of **applied research experiences** on topics including community development, ecosystem restoration, environmental policy, environmental law, environmental science, fisheries, forestry, natural resource management, parks and recreation, soil science, sustainable agriculture, sustainable business management, water science and wildlife.



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49 students engaging in undergraduate research through SENR's honors program

10 students earning research distinction

27 students earning undergraduate research credit, and multiple STEP scholars

RESPONSE

To help prepare our students for future careers, SENR has aggressively developed and promoted research opportunities for undergraduates. Currently, there are 49 students engaging in undergraduate research through SENR's honors program, 10 students earning research distinction, and 27 students earning undergraduate research credit, and multiple STEP scholars. These programs help our students develop practical research skills, encourage global awareness, enrich their academic experience, develop **leadership skills** and instill a **commitment to community service**. Students acquire training in a wide range of research methods, and learn to communicate their results orally and in writing by presenting papers or posters at scientific meetings and by serving as **coauthors on the published papers**. These efforts encourage our students to gradually transition into independent scientists who are able to actively participate in research that is highly interdisciplinary in nature.



develop leadership skills

instill a commitment to community service



IMPACT

Our undergraduate student research programs have helped a large number of students achieve their goals of working as professional scientists. They have presented their work at scientific meetings, published in peer-reviewed journals, participated in summer fellowship and internship programs and won awards and scholarships for their work. Nine undergraduate students presented their research at the 2019 CFAES Undergraduate Research Forum. Two of these students won awards for their work. Several students presented at the 2019 Denman Forum and one student won awards for their work. Four students were awarded \$3,300 from the OARDC Undergraduate Seeds Grant Program. One student was awarded \$4,500 from Ohio State's Undergraduate Research Apprentice Program. One student was awarded the prestigious Udall Undergraduate Scholarship (\$7,000) and one student was awarded a Fulbright Award. Two students published research with their faculty mentors in peer-reviewed journals.

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Promoting Positive Relationships between Human and Wildlife Communities through Partnerships, Stakeholder Engagement, and Science

Impact Statement 2019

INVESTIGATORS

Robert Gates, Marne Titchenell, Jeremy Bruskotter, Stanley Gehrt, Stephen Matthews, Christopher Tonra, William Peterman, Alia Dietsch and Gabriel Karns

SUMMARY

Over 5.1 million people engage in wildlife-based recreation in Ohio, contributing \$3.3 billion to the economy. Wildlife promote physical and spiritual well-being and are sensitive indicators of environmental quality and ecosystem health. As wildlife conservation increases in scope and complexity, SENR faculty and staff **provide research and facilitate collaborations that help ensure sustainable wildlife populations and habitats are valued and conserved now and in the future.**



Photo credit: Jeff Nelson

SITUATION

Human-wildlife relationships arise from interactions of natural and social systems. Problems develop as natural and cultural environments change. Government agencies and NGOs are challenged by competing interests of stakeholders, and scientific uncertainties about the systems they manage. Biodiversity loss, invasive species, species endangerment, a changing climate, sustainable use of wildlife resources, human-wildlife conflicts, and changes in public demand for wildlife-based recreation are among the most pressing concerns faced by wildlife managers. Fulfilling the land grant mission of The Ohio State University requires science-based research and training for current and future wildlife professionals, community leaders, and private landowners, and strong collaborations and partnerships between researchers, management agencies, and stakeholders.



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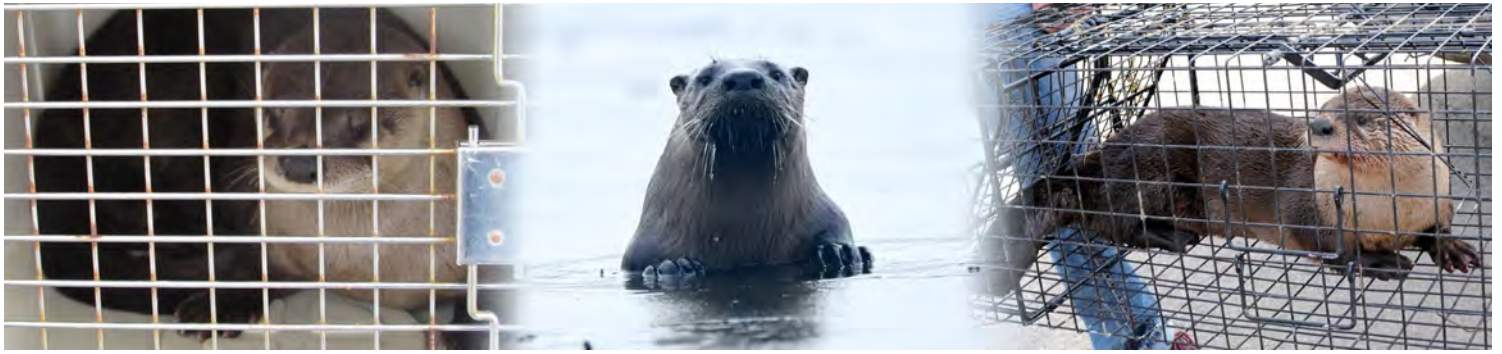


Photo credit: Jeff Nelson

RESPONSE

Through the Terrestrial Wildlife Ecology Lab, Ohio Biodiversity Conservation Partnership, and OSU Extension, we focus on public access to private lands, human-wildlife conflicts, and conservation of wildlife diversity on public and private lands within Ohio and across the United States. We worked with the Ohio Division of Wildlife to **improve the state's private lands recreational access program**, and to **develop a socially and ecologically sustainable plan for deer harvest management**. Our research on river otters, a former extirpated species, was used to **set sustainable harvest levels**. We identified more **ecologically sustainable approaches to forest management** that use fire, and studied tree harvest to **restore habitat** for rattlesnakes, amphibians, and woodland birds. We also **informed managers** of 35 national wildlife refuges administered by the U.S. government. We **disseminated information** through extension programs, websites and multimedia, workshops and conferences, and other publications.

Studied recreational preferences and economic impact of
>6,000 visitors
to **35** national wildlife refuges

48 presentations made by the Wildlife Extension team to **4,100** professionals, volunteers, and homeowners

>250,000 views of multimedia pertaining to rattlesnakes and coyotes

IMPACT

The recreational access program opens 250,000 acres to Ohio users, and we are evaluating policies to retain critical habitat and increase public access. Our research assists managers in **striking a balance** between ~500,000 deer hunters that contribute >\$800 million to the Ohio economy, and farmers who are losing crops to deer depredation. Our river otter research balances population and harvest goals while **minimizing human-wildlife conflicts** in almost half of Ohio's counties. Our studies of impacts of forest restoration on rattlesnakes and other wildlife has **informed forest management** on ~3.3 million acres of public land in southeast Ohio. We led a nation-wide study of federal public lands in the National Wildlife Refuge System to inform managers about the **recreational preferences and economic impact** to local communities of over 6,000 people who visited 35 national wildlife refuges during 2019 (see go.osu.edu/NVSresults). The impact of our research was amplified by disseminating findings through OSU Extension and other outreach efforts. The Wildlife Extension team delivered 48 presentations on human-wildlife conflicts to 4,100 professionals, volunteers, and homeowners. Multimedia pertaining to rattlesnakes and coyotes received >250,000 views. The Ohio Community Wildlife Cooperative **facilitates networking** and **communicates science-based knowledge** through an annual conference attended by community leaders, city planners, and resource managers from 103 Ohio municipalities and park districts.

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Managing Ohio's Forest Resources

Impact Statement 2019

INVESTIGATORS

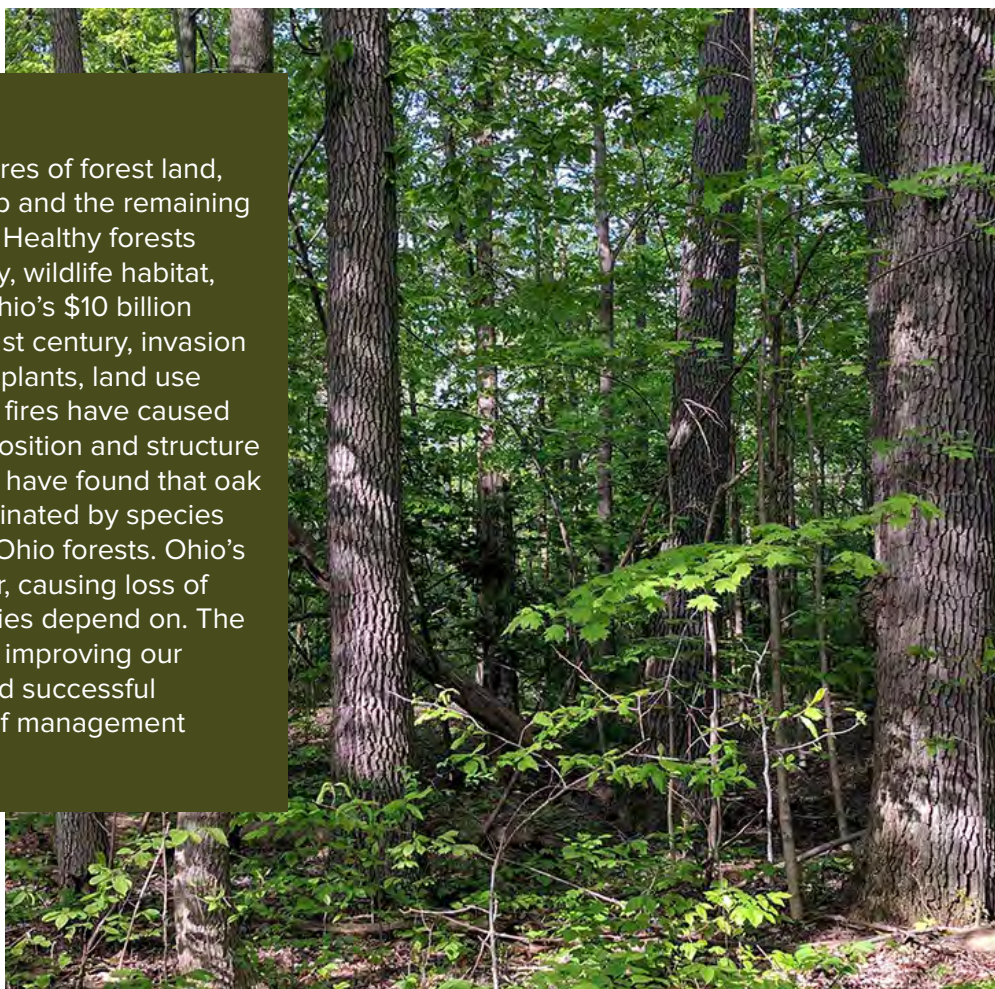
Matt Davies, Bob Gates, David Hix, Stephen Matthews, Sayeed Mehmood, Kathy Smith, Roger Williams

SUMMARY

Ohio's forests are transforming due to changes in natural disturbance regimes, including introduction of invasive species and absence of disturbance such as fire. Young forest habitat is disappearing as forests age. Re-introducing natural disturbance and reducing forest canopies along agricultural fields have been used to mitigate these problems. The Woodland Stewards program offers a variety of programs and publications to help private landowners, agencies and NGOs manage their forestlands.

SITUATION

Ohio has approximately 8 million acres of forest land, of which 85% is in private ownership and the remaining 15% in state and federal ownership. Healthy forests are critical for sustaining biodiversity, wildlife habitat, and support over 120,000 jobs in Ohio's \$10 billion forest products industry. Over the last century, invasion of non-native insects, diseases and plants, land use change, and the absence of natural fires have caused major changes in the species composition and structure of Ohio's forests. Long-term studies have found that oak forests are changing to forests dominated by species that are uncharacteristic of historic Ohio forests. Ohio's forests overall are also getting older, causing loss of young trees that many wildlife species depend on. The future of Ohio's forests depends on improving our understanding of these changes and successful development and implementation of management strategies to reverse them.



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RESPONSE

SENR faculty have **pioneered new approaches** including managing some forests in an early successional state; developing “soft” habitat edges along maturing woodlots for wildlife; and educating private landowners on how to manage forests under changing climate conditions. Further, as Ohio’s population becomes more urban, our faculty have provided research and teaching to **expand our understanding of the importance of urban forests** as part of larger ecosystems. We also conduct economic and human dimensions research to better understand **drivers of forest management decisions** and to **quantify the value of forests** for timber and non-timber purposes. Our Ohio Woodland Stewards Program provides workshops and materials to meet the educational needs of Ohio’s private woodland owners, as well as public agency and NGO forest managers.

2020 WOODLAND STEWARDS WORKSHOPS:



9,300 landowners trained

1,891 professionals trained

9,892 mobile downloads

IMPACT

Our work is **regularly used to support local, state and federal initiatives** to manage forests and wildlife resources. In southwestern Ohio as part of the National Bobwhite Conservation Initiative our research was used to develop wildlife habitat incentives for private-woodland owners. We also **collaborated** with the U.S. Forest Service and others to help recover and sustain our state’s critical oak forests. Information about understory plants and guidance about the appropriate timing, frequency and severity of planned disturbances, has allowed forest managers **to better identify and anticipate changes** in forest composition and non-native invasive species encroachment pattern, and take steps that lead to more **successful oak forest regeneration**. Our work with urban forest managers has **helped improve** efforts to restore riparian forests. In collaboration with colleagues in neighboring states, our Woodland Stewards workshops on non-native invasive species has **trained 1891 natural resource professionals and over 9300 landowners**, while our **smart phone app** designed to help identify and report invasive species has been **downloaded more than 9892 times** and generates hundreds of reports each year. Finally, our work has documented the **contribution forests make to the state’s economy**, leading to greater public and private support for this important sector. Every year, a wide spectrum of stakeholders relies on our Ohio Timber Price Report to **make critical decisions** about forest harvests.

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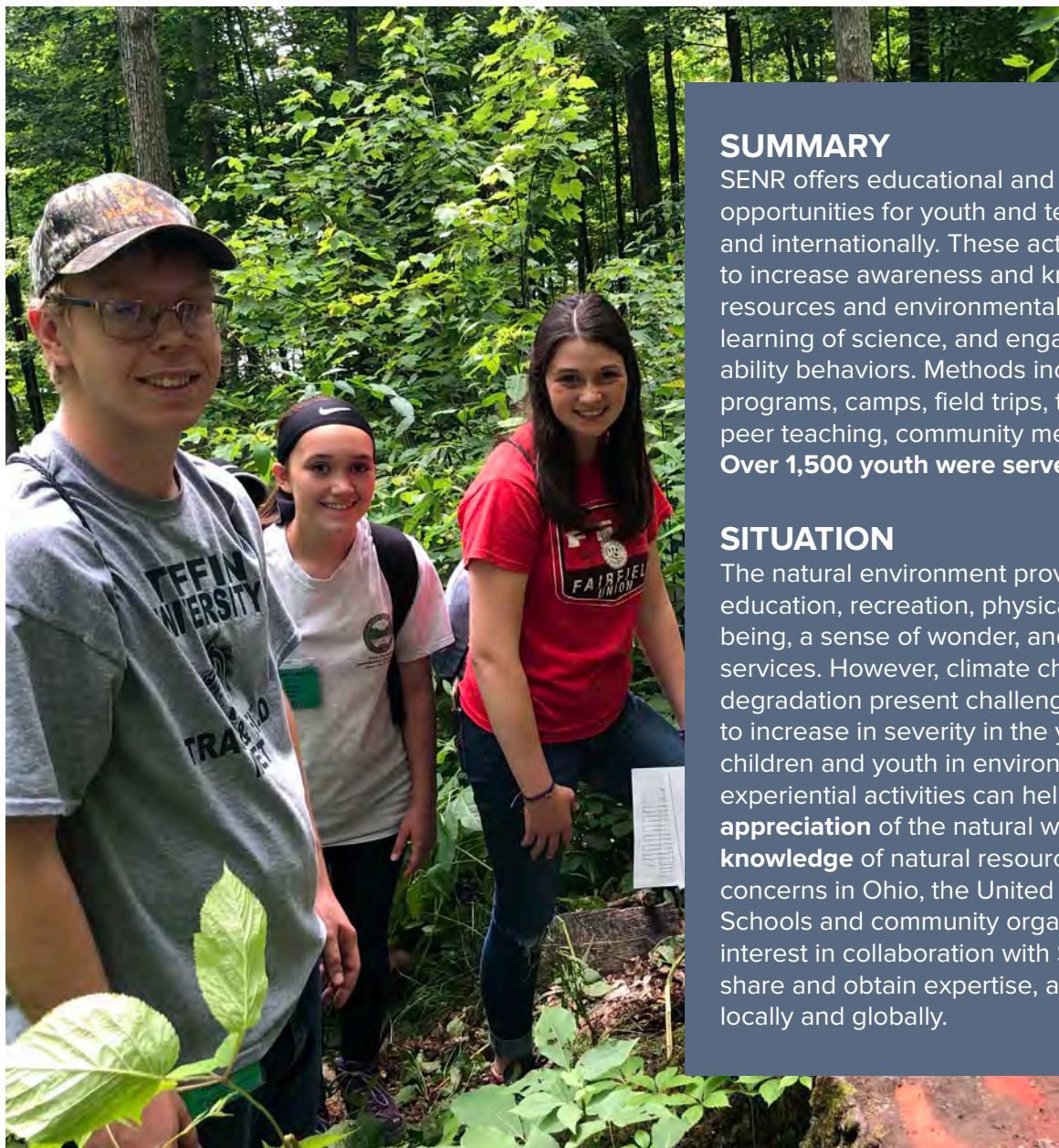


Youth Environmental Programs

Impact Statement 2019

INVESTIGATORS

Eugene Braig, Suzanne Gray, Greg Hitzhusen, Kristi Lekies, Marne Titchenell



SUMMARY

SENR offers educational and experiential learning opportunities for youth and teachers across Ohio and internationally. These activities are designed to increase awareness and knowledge of natural resources and environmental issues, promote learning of science, and engage youth in sustainability behaviors. Methods include presentations, programs, camps, field trips, teacher workshops, peer teaching, community media, and consultation. **Over 1,500 youth were served in 2019.**

SITUATION

The natural environment provides opportunities for education, recreation, physical and emotional well-being, a sense of wonder, and valuable ecosystem services. However, climate change and environmental degradation present challenges that are expected to increase in severity in the years ahead. Engaging children and youth in environmental education and experiential activities can help to **foster lifelong appreciation** of the natural world and **increase knowledge** of natural resources and environmental concerns in Ohio, the United States, and the world. Schools and community organizations express interest in collaboration with SENR to reach youth, share and obtain expertise, and make connections locally and globally.



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70 youth involved in Youth Beat Radio

150 students on field trips at the Schiermeier Olentangy River Wetland Research Park

>150 students engaged in discussions of water quality in Ohio and Uganda in our Water Across the World project

15 teachers to incorporate bird feeding and bluebird monitoring into their curriculum

21 educators develop lesson plans on “Attacking Aquatic Invader”

252 youth took part in eleven programs offered by our wildlife and forestry faculty

RESPONSE

In 2019, our faculty and staff **engaged** in a wide range of media outreach projects and **built collaborations** with schools and organizations to **reach diverse groups of Ohio youth**. SENR’s **Youth Beat Radio** program aired weekly on two Columbus community radio stations and involved 70 youth. Our aquatic science team hosted 150 students on field trips at the **Schiermeier Olentangy River Wetland Research Park**, including one led by SENR Senior Capstone students. At the state science fair we judged 16 science projects and offered programs to 200 students interested in aquatic sciences. Our **Water Across the World** project engaged >150 students’ in discussions of water quality in Ohio and Uganda. Our wildlife and forestry faculty offered 11 programs for 252 youth, including **Camp Canopy**, a summer camp for high school students. We worked with 21 educators to develop lesson plans on “Attacking Aquatic Invader” and with 15 teachers to incorporate bird feeding and bluebird nest box monitoring into their curriculum.



IMPACT

In 2019, over 1,500 youth learned about natural resources and environmental issues, participated in hands-on exploration, applied knowledge to real world situations, learned new skills, and engaged in sustainability efforts. SENR education activities serve youth from elementary through high school, from rural and urban areas, and those with special needs. **For some youth, the activities provided their first experiences with wetlands, wildlife, scientific methods, hands-on nature exploration, and interacting with faculty and Extension specialists.** The Water Across the World project created an opportunity for rural Ohio youth to engage in peer teaching, learning, and cultural exchange with youth in Uganda on water quality issues through video and online communications. Workshops and materials developed for teachers extended knowledge to additional students. We also provided learning opportunities for SENR undergraduate and graduate students who plan and lead Water Across the World and other education activities. **SENR youth education creates and strengthens collaborations with community partners** including the Urban Park Development LLC, Columbus and Hilliard City schools, and local organizations. Youth Beat Radio, which is produced by SENR alumni, SENR students, and high school students, broadcast information on environmental issues to community audiences. Consultation activity benefited schools and organizations in planning programs, sharing resources, and evaluation.

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Supporting Sustainable Energy Transitions: Understanding the Links between Energy and Society

Impact Statement 2019

INVESTIGATORS

Ramiro Berardo, Stacey Fineran, Jeffrey Jacquet, Nicole Sintov, Robyn Wilson

SUMMARY

Energy and people are connected across numerous scales. Human behaviors both impact and are impacted by transitions in energy systems, particularly in the face of climate change and new technologies. SENR faculty are **national leaders** in research on energy production, distribution and consumption to understand the relationships between society and energy systems. We also develop teaching and outreach programs to enhance energy literacy and increase social well-being amid energy transitions.

SITUATION

Ohio has historically been a leader of the production and use of energy. Ohio's coal industry fueled the industrial revolution while our coal and nuclear energy continue to power the region's largest population and industrial centers. More recently, Ohio has hosted shale development via hydraulic fracturing, large wind farm development, and large-scale solar arrays. These energy transitions affect all residents, landowners, and consumers, though the distribution of costs and benefits from production and consumption of energy is spread unevenly across the state. Research is needed to guide public policy to maximize social, economic, and environmental outcomes. Despite its importance, many residents have little understanding of the state's energy systems. Research, teaching, and outreach programs are required to mitigate problems associated with the production of energy and to increase energy literacy to allow consumers to make informed decisions about their own behavior.



Image by seagul from Pixabay



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RESPONSE

SENR faculty and students bring diverse scientific research and outreach skills to unpack the linkages between people and the production and consumption of energy.

Our faculty and students are **leading research projects** to understand:

- how states legislate and regulate energy production
- how landowners respond to opportunities to host new types of energy production
- how different forms of energy development and distribution impact local residents and communities
- variation in attitudes towards energy development, distribution and use
- drivers of consumer behaviors and energy usage patterns

Our courses use energy issues to explore the complicated linkages between policy and the social, economic and environmental outcomes of energy transitions. Students gain **increased levels of energy literacy, knowledge of the social-political, environmental and economic aspects of energy**, and learn how to apply this knowledge to real world problems and case-studies.



IMPACT

Supported by competitive external grants, in 2019 our faculty continued to **grow a nationally-recognized research agenda on social aspects of energy transitions**. Two of our faculty helped write a successful 5-year NSF National Research Traineeship grant, which is being used to **launch an interdisciplinary graduate specialization in sustainable energy**. In another project, we conducted extensive text analysis of media stories to examine the drivers of conflict over hydraulic fracturing for oil and gas production across 15 different states. As part of an NSF INFEWS project, we distributed almost 5,000 surveys in 2019 to assess how farm operators and non-operating landowners in the Great Lakes region are likely to respond to economic pressures and incentives associated with sustainable energy policies. Findings showed that support for wind energy development was stronger among operators than non-operators, and farmers with larger operations were more likely to allocate land to wind energy. Finally, we conducted a study to evaluate the impact of sustainability-focused discussions on building energy use among roommate pairs in a dormitory at Oberlin College. In addition to our research, our work in the classroom continued to raise the energy literacy of hundreds of Ohio State undergraduate and graduate students by engaging them in hands on applications of academic theory and research to tackle real world energy issues.

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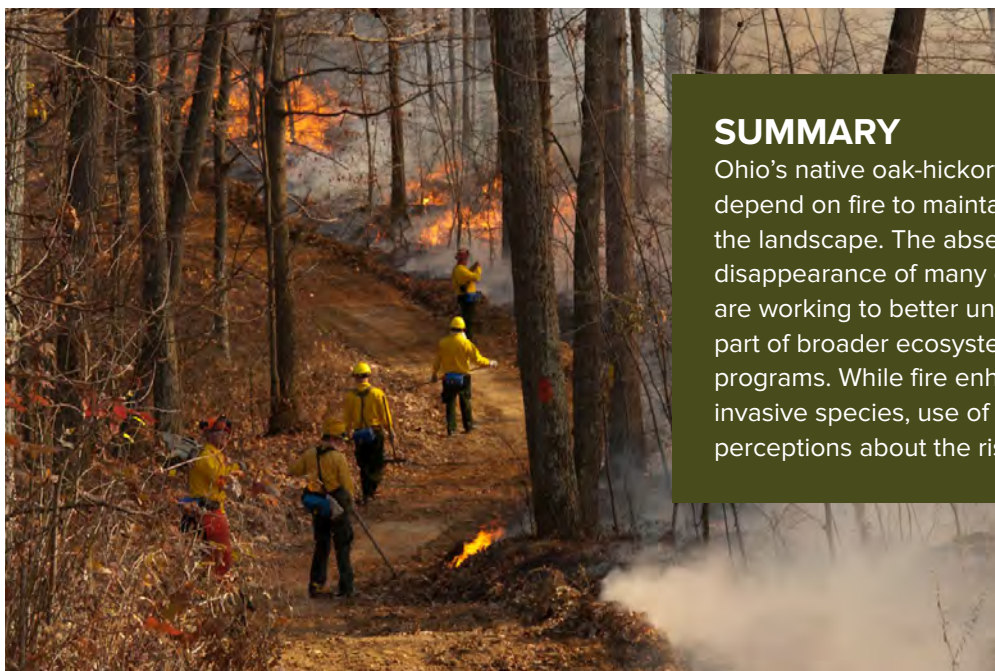


Bringing Back the Fire: Pioneering new approaches to using prescriptive fires to restore Ohio's native landscapes.

Impact Statement 2019

INVESTIGATORS

Matt Davies, Matt Hamilton, Steve Matthews, Eric Toman, Roger Williams, Robyn Wilson



SUMMARY

Ohio's native oak-hickory forests, prairies and peatland depend on fire to maintain their health and presence on the landscape. The absence of fire has led to the near disappearance of many of these ecosystems. SENR faculty are working to better understand how fire can be used as part of broader ecosystem management and restoration programs. While fire enhances biodiversity and reduces invasive species, use of fire will require addressing public perceptions about the risks and benefits of fire.

SITUATION

Prior to European settlement, forests, prairies and peatlands occupied over 28 million acres in Ohio. Land development and historical fire suppression have diminished these ecosystems by 71%, 90% and 98%, respectively. These ecosystem losses have had negative effects on forest industries and wildlife. The lack of fire and associated encroachment of non-native plants continue to threaten these valuable ecosystems. While the managed use of fire can contribute to restoration, understanding fire behavior and the risks prescribed fire poses to human communities is critical. Despite these risks, residents have indicated cautious acceptance of prescribed fire when they understand the rationale for its use and know that it will be implemented safely and effectively. Fire managers have many decision support tools available to help them balance risks and benefits of fire. The information these tools provide can help guide tactical decisions such as the placement of particular fire resources.



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RESPONSE

SENR faculty are leaders in research and innovation, combining expertise in ecology and human dimensions to determine how fire can be used to protect and restore Ohio's native ecosystems, focusing on how:

- (a) prescribed burning can be used as an ecosystem restoration tool in grasslands and forests
- (b) variation in fire regimes influences the structure and function of prairie and oak forest ecosystems
- (c) fire shapes the balance between invasive and native species
- (d) artificial intelligence can provide fire managers with real-time fire behavior data

In examining the human response, SENR faculty are:

- (a) developing effective public programs and strategies for fire preparedness on private property
- (b) studying factors that shape community wildfire protection planning processes and management decision-making, and the dynamics of incident management teams that affect decision-making
- (c) examining how and when decision support tools are used by fire managers



IMPACT

Our work has provided state resource managers **vital information** to guide their use of prescribed fire to restore oak-hickory, prairie and peatland ecosystems. We have also included expanded information about the use of fire in our courses, where the **next generation** of resource managers received information and certification that meet Federal ICS-100, S-110, S-130 and S-190 requirements for wildland firefighter (red card) certification. Students who completed our program have taken seasonal and permanent positions in fire crews and are regularly employed by organizations that use prescribed fire as part of their ecosystem management. Our collaborations with the College of Engineering have also produced a mission planning platform that uses drones for **monitoring** and **predicting** fire behavior in real-time. SENR faculty have also provided **critical leadership** and guidance to the Lake States Fire Science Consortium, which coordinates fire planning efforts in the region, by producing factsheets, courses for academic credit, workshops, and field tours and hosted a webinar series. Our research on trade-offs among management objectives in fire-prone forests **discovered opportunities** to increase the scale and effectiveness of prescribed fire. Our research has led to **recommendations** to facilitate the use of risk-based decision support tools by assessing their reliability under climate change and encouraging familiarity and trust between members of the incident management team.

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Environmental Professionals Network

Annual Report 2019-2020

COORDINATORS

Joe Campbell, Nicole Jackson

SUMMARY

The Environmental Professionals Network (EPN) connects Ohio's environmental professionals and others passionate about our natural resources through in-person and online activities. EPN hosts monthly breakfast programs and virtual events focused on innovative and pressing environmental topics, such as: bipartisan approaches for wildlife conservation, inclusive strategies for land management, and collaborative approaches to solving emerging water pollution issues. The EPN aligns inspirational speakers with compelling topics aimed to help participants build their network and grow professionally.

Through this network, participants also have free access to many online networking capabilities, such as marketing, querying, information sharing, and more. Participants are also encouraged to create and share content such as job postings, reports, and event announcements. In its eight-year history, over 3,000 unique individuals have participated in an EPN breakfast program and this year the EPN surpassed 2,200 online participants.



2019-2020 EVENT ATTENDANCE

- 1,309 unique attendees, including 365 current Ohio State students (from 61 different majors) and 137 Ohio State Alumni participants
- 145 participant average at monthly, in-person breakfast events
- 211 participant average at monthly, online virtual events

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MOVEMENT TO VIRTUAL EVENTS

Since September 2012, the EPN has consistently held monthly face-to-face, in-person events featuring breakfast and conversation alongside our educational speakers. In March 2020, in response to the Covid-19 pandemic, the EPN transitioned from its traditional event format to online-only programming. This transition, which will be in place for the remainder of 2020, has fundamentally shifted the nature in which we interact with one another, share information and build relationships. While our global community seeks to address this virus, our challenge and opportunity as environmental professionals and enthusiasts to improve ecological systems as well as social and economic conditions remain. Here in Ohio, nationally and globally it can be challenging to get different views together to work out real solutions, however the EPN recognizes these challenges and are very committed to working diligently to help achieve a broadly healthy and regenerative society and planet. As we move into the 2020-2021 Academic Year let us stay connected, be inspired, and grow professionally, together.

Co-sponsored events this year included partnerships with various local, state, regional, and national organizations. Thank you to the following organizations that served as event sponsors and to the individuals who chose to help sponsor a student during their registration.



Mark Bamberg
Brian Becker
Richard Bersnak
Mark Bogue
Candice Brothers
Chris Burger
Liz Cabot
Bob Campbell
Jeremy Carroll
Steven Carter
Rao Chitikela
Mona Cook-Haught
Jim Cowardin
Matthew Dickinson

Jan Douglass
Daniel Dudley
Claus Eckert
Randy Edwards
Lynn Elfner
Kathi Farrell
Rick Fitch
Tracy Freeman
Jonathan Gerken
Stormy Gibson
Bill Habig
Karen Hallberg
John Heywood
Stan Johnson

Linda Johnson
Cecilia Jokerst
Phil Kabealo
David Kalkbrenner
John Kelley
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Mark Real
Heather Robinson
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Doyle Schilling
Alli Shaw
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Preparing Students through Experiential Learning in All Five SENR Majors

(EEDS: Environment, Economy, Development and Sustainability; EPDM: Environmental Policy and Decision Making; ES: Environmental Science; FFW: Forestry, Fisheries and Wildlife; NRM: Natural Resource Management)

Impact Statement 2020

FUNDING SOURCES

USDA Competitive Grant, Internal Ohio State University Grants, Commodity Groups, Industry Grants

Other Funding: Columbus Foundation; City of Columbus: Ohio State Student Life grant; ODW grant (funds 5 student internships with TWEL each summer); Ohio State Connect and Collaborate, FirstEnergy Corporation

INVESTIGATORS

David Hix, Scott Demyan, Alia Dietsch, Matt Hamilton, Greg Hitzhusen, Gabe Karns, Chris Tonra, Bill Peterman, Suzanne Gray, Matt Davies, Joseph Campbell



SUMMARY

One of the most dynamic ways SENR prepares students for careers and graduate study is to engage them in experiential learning activities that help students integrate the concepts and skills they have gained in the classroom. Our main venues for experiential learning are capstone courses, internships, and field-based studies, all of which have evolved and expanded during 2020. Experiential learning opportunities help enhance the teaching, research, and outreach missions of the School.



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SITUATION

A growing body of research demonstrates that hands-on and field experiences — in which students apply theoretical ideas to real-world situations — contribute to their intellectual development. Employers indicate that they want college graduates to have more practical experience working in collaborative, multi-disciplinary teams addressing complex problems as a way to transition students from their formal studies into successful careers, and surveys indicate that the first job of over 50% of students after graduation is a direct result of an internship. Historically, environment and natural resources curricula have capitalized on opportunities to use outdoor settings to expose students to natural landscapes and diverse ecosystems, and to interact with professional natural resource managers. The range of contemporary sustainability challenges also invites integrative, experiential inquiries, and our students greatly benefit from the immersive, real-life experiences provided by capstone courses, internships, and field study courses.

RESPONSE

Each of the five SENR majors includes experiential learning opportunities designed to solidify ideas, concepts, and tools presented in the classroom. In 2020 we offered several different capstone courses where student teams collaborated with community partners. EEDS majors worked with city and Ohio State staff to evaluate sustainable transportation, energy, and waste campaigns. FFW and NRM students collaborated with the Columbus and Franklin County Metro Parks, City of Columbus Recreation and Parks Department, Friends of the Lower Olentangy Watershed (FLOW), Green Columbus, and the Ohio Department of Natural Resources. ES and EPDM students designed restoration proposals to align the campus landscape with Ohio State's Sustainability Goals, and EPDM majors partnered with the City of Columbus to tackle water-quality issues. Our ES students developed multifunctional management and restoration plans for Antrim Park. We also offered a suite of field studies courses with hands-on application of concepts that enhanced experiential learning, including Forest Ecosystems, Avian Wildlife Biology and Management, Wildlife Ecology Methods, and Practical Skills for Ecosystem Restoration.



IMPACT

Capstone student projects contributed directly to improved ecosystem management by empowering local residents and informing local decision-makers. Students worked with 8 private landowners and collaborating agencies (e.g., ODNR, NRCS, SWCD) to produce actionable habitat management plans to complete course requirements. Specifically, our EEDS capstone projects continued to help local people, businesses, and public officials navigate a suite of complex sustainability challenges. Our FFW/NRM capstone projects assessed tree canopy coverage throughout Columbus neighborhoods; assisted other Columbus park managers with habitat management and restoration plans; collected data on silvicultural demonstration areas; and partnered to implement a maple syrup operation at Ohio State Mansfield. Our EPDM capstone students focused on urban water quality issues and developed strategies for adapting outreach and stakeholder engagement approaches to digital settings, as well as for addressing equity and broadening participation in environmental problem-solving, in partnership with the City of Columbus Department of Utilities. Additionally, our Practical Skills for Terrestrial Ecosystem Restoration course provided 50 students with ODA pesticide licensing and OFA chainsaw qualifications; they also contributed to restoration of 5+ acres of Ohio State's campus through removal of invasive species, woodland creation, and prairie restoration. Our capstone courses, internships, and field-based studies facilitated student career success, as evidenced by an 88% job placement rate for recent SENR graduates.

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Managing Ohio's Forest Resources

Impact Statement 2020

FUNDING SOURCES

USDA Capacity Grants (McIntire-Stennis, Hatch); Other Federal Grants; Internal Ohio State Grants; Federal and State Agencies

INVESTIGATORS

Matt Davies, Bob Gates, David Hix, Stephen Matthews, Sayeed Mehmood, Kathy Smith, Roger Williams

SUMMARY

Ohio's forests are transforming due to changes in natural disturbance regimes, including introduction of invasive species and absence of disturbance such as fire. Young forest habitat is disappearing as forests age. Re-introducing natural disturbance and reducing forest canopies along agricultural fields have been used to mitigate these problems. The Woodland Stewards program offers a variety of programs and publications to help private landowners, agencies and NGOs manage their forestlands.

SITUATION

Ohio has approximately 8 million acres of forest land, of which 85% is in private ownership and the remaining 15% in state and federal ownership. Healthy forests are critical for sustaining biodiversity, wildlife habitat, and support over 120,000 jobs in Ohio's \$10 billion forest products industry. Over the last century, invasion of non-native insects, diseases and plants, land use change, and the absence of natural fires have caused major changes in the species composition and structure of Ohio's forests. Long-term studies have found that oak forests are changing to forests dominated by species that are uncharacteristic of historic Ohio forests. Ohio's forests overall are also getting older, causing loss of young trees that many wildlife species depend on. The future of Ohio's forests depends on improving our understanding of these changes and successful development and implementation of management strategies to reverse them.



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RESPONSE

SENR faculty have pioneered new approaches including managing some forests in an early successional state; developing “soft” habitat edges along maturing woodlots for wildlife; and educating private landowners on how to manage forests under changing climate conditions. Further, as Ohio’s population becomes more urban, our faculty have provided research and teaching to expand our understanding of the importance of urban forests as part of larger ecosystems. We also conduct economic and human dimensions research to better understand drivers of forest management decisions and to quantify the value of forests for timber and non-timber purposes. Our Ohio Woodland Stewards Program provides workshops and materials to meet the educational needs of Ohio’s private woodland owners, as well as public agency and NGO forest managers.

IMPACT

Our work is regularly used to support local, state and federal initiatives to manage forests and wildlife resources. In southwestern Ohio as part of the National Bobwhite Conservation Initiative our research was used to develop wildlife habitat incentives for private-woodland owners. We also collaborated with US Forest Service and others to help recover and sustain our state’s critical oak forests. Information about understory plants and guidance about the appropriate timing, frequency and severity of planned disturbances, has allowed forest managers to better identify and anticipate changes in forest composition and non-native invasive species encroachment pattern, and take steps that lead to more successful oak forest regeneration. Our work with urban forest managers has helped improve efforts to restore riparian forests. In collaboration with colleagues in neighboring states, our Woodland Stewards workshops on non-native invasive species has trained 2589 natural resource professionals and over 9815 landowners. Our smart phone app is being utilized to track Ohio’s new invasive insect threat - spotted lanternfly. Citizen scientists and natural resource professionals are using it to track both the host plant and insect. Finally, our work has documented the contribution forests make to the state’s economy, leading to greater public and private support for this important sector. Every year, a wide spectrum of stakeholders relies on our Ohio Timber Price Report to make critical decisions about forest harvests.



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Soil and Land Use Management to Enhance Terrestrial Carbon Sequestration for Improving Soil and Ecosystem Health and Mitigating Climate Change

Impact Statement 2020

Funding Sources

USDA Competitive Grants, USDA Capacity Grants (Hatch, MS), and Other Federal Grants, Commodity Groups, State of Ohio, Private Sector, and Foundations

INVESTIGATORS

Rattan Lal, Klaus Lorenz, Dave Barker, Marilia Chiavegato, Steve Culman, Matt Davies, Scott Demyan, Rachel Gabor, Matt Hamilton, Jeff Hattey, Dennis Heldman, Laura Lindsey, Steve Lyon, Steve Matthews, Sayeed Mehmood, Ajay Shah, Brian Slater, Kathy Smith, Brent Sohngen, Christine Sprunger, Mark Sulc, Eric Toman, Roger Williams, Kai Zhao

SUMMARY

Soil health, ecosystem health and human well-being are indivisible. However, soil, ecosystem degradation, and climate change are increasingly deteriorating essential soil and ecosystem functions which critically depend on soil- and land-use specific soil organic carbon (SOC) stocks. The CFAES Dr. Rattan Lal Carbon Management and Sequestration Center (C-MASC) conducts research on terrestrial carbon sequestration to adapt soil and land management to climate change by climate-resilient practices, enhance land and soil functions for human well-being, and partly off-set anthropogenic emissions. Improved scientific knowledge on soil and land management is disseminated among local, regional, national and international collaborators and stakeholders to advance soil and ecosystem stewardship for current and future generations.



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SITUATION

Soil, forest, and other terrestrial ecosystems provide essential ecosystem services such as the provisioning of food, feed, fuel, fiber and clean water for human well-being. However, degradation by inappropriate soil and land management practices, and by climate change depletes the SOC stock on which the function of all terrestrial ecosystems depend. Soils and terrestrial ecosystems can only fulfill their functions under soil- and land-use specific SOC stocks. Maintaining the SOC stock is therefore prerequisite for securing essential soil functions while increasing the SOC stock contributes to climate change adaptation and mitigation.



RESPONSE

We address carbon management of soil, forest, and other terrestrial ecosystems through integrated basic and applied research in the laboratory and field, in the classroom and via outreach. Among the major focus areas is management of SOC sequestration for improving soils of agroecosystems and forest land uses. We research effects of soil erosion, conservation agriculture, soil compaction, organic amendments, biochar, biofuel feedstock production, organic farming, forest management, coal mine land reclamation, ecosystem restoration, and wildfire on SOC stocks, soil health and greenhouse gas fluxes. C-MASC and its global cooperators have estimated technical potential of carbon sequestration in soil and vegetative biomass to create a drawdown of atmospheric CO₂ by the year 2100. Another major focus area is advising and disseminating knowledge about the sustainable use of forests and soil for environmental and economic gains among the public, land managers, private sector and policymakers.

IMPACT

We are globally recognized as a top authority on soil and land management for enhancing SOC and forest carbon (FC) sequestration to improve the livelihoods of those directly depending on land and soil resources and beyond. C-MASC has hosted about 200 visiting scholars from around the world who are now part of an international network of researchers. Our research incentivizes the adoption of soil- and land-specific management practices to maintain or increase SOC and FC stocks locally, regionally, nationally and globally. We are working with land managers and private sector to reduce the carbon footprint of food and wood production and supply chains. We are engaging a transdisciplinary community of faculty across The Ohio State University in working groups to identify research priorities which will be addressed by collaborative responses to calls for proposals and culminate in securing extramural funding for joint research projects.

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Protecting Ohio's Water Resources

Impact Statement 2020

Funding Sources

NSF; CDC; USDA/NIFA; USEPA; USFWS; USGS; Hatch; McIntire-Stennis; Great Lakes Protection Fund; Great Lakes Restoration Initiative; The Nature Conservancy; Ohio Corn, Wheat & Small Grain Grower Associations; Ohio Soybean Council; Ohio Department of Natural Resources; Ohio Water Development Authority; Franklin County Metroparks; Franklin County SWCD; Ohio Water Resource Center; Ohio Sea Grant

Collaborators/Partners

Appalachia Ohio Alliance; Buckeye Lake Historical Society; Fondriest Environmental; National Aquatic Nuisance Species Task Force; National Ground Water Association; National Wildlife Federation; ODA; ODNR; OEPA; ODH; Ohio Sea Grant; The Great Lakes Commission; The Nature Conservancy; The Wilderness Center; USDA-ARS; Resources for the Future; Western Reserve Land Conservancy; Black Environmental Leaders

INVESTIGATORS

Mažeika Sullivan, Douglas Jackson-Smith, Anne Baird, Eugene Braig, Matt Davies, Libby Dayton, Robyn Wilson, Lauren Pintor, Suzanne Gray, Rachel Gabor, Ramiro Berardo, Richard Dick, Steve Lyon

SUMMARY

Losses in biological, chemical, and physical water quality threaten the environment, as well as human health and well-being. To address this challenge, our team of professionals – spanning the natural and social sciences, education, and outreach – work across Ohio to improve water quality including reducing nutrient loads, restoring aquatic ecosystems, and protecting biodiversity.



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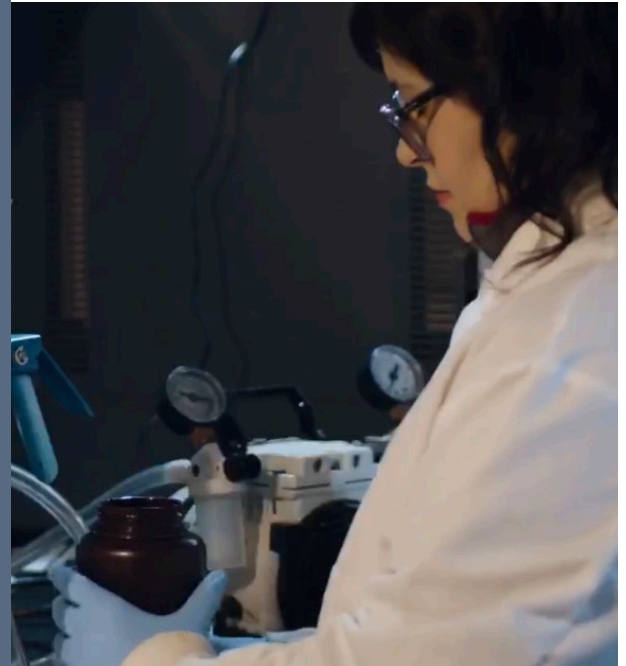
SITUATION

Ohio's water resources provide a wide range of important services, including drinking water and irrigation, power, fisheries, scenic value and recreation, and ecosystem functions. Changes in population, land use, and climate have compromised water quality, fragmented habitat, and contributed to loss of biodiversity in streams, rivers, and wetlands, often with serious effects on environmental condition and human health. For example, the frequency and severity of harmful algal blooms in both Lake Erie and the Ohio River have resulted in losses of water supply and continued impacts on fishing and recreation industries. Aging rural septic systems are an increasing source of groundwater contamination. New and emerging contaminants such as microplastics and pathogens also pose serious challenges to aquatic ecosystem integrity. These and other environmental stressors must be addressed to sustaining and improve the water quality that is vital to Ohio's quality of life, economy, and environment.

RESPONSE

In 2020, SENR used our multidisciplinary expertise (aquatic and soil sciences, sociology, decision science) and engaged in integrated applied research, extension and outreach activities through the Ohio Certified Volunteer Naturalist Program, Aquatic Ecosystems Extension Program, and at the Schiermeier Olen-tangy River Wetland Research Park (ORWRP) to advance three goals:

1. Reduce Nutrient Loads: We used surveys and instrumented fields to understand farmer conservation decisions and their impact on water quality and used this knowledge to develop decision-support tools.
2. Restore Impaired Ecosystems: We monitored urban streams for the impacts of invasive species, artificial lighting, and contaminants on aquatic biodiversity and water quality, and documented the effects of restoration efforts on coastal wetlands.
3. Protect Biodiversity: We raised and conducted translocations of rare fish species to help restore extirpated/endangered populations in Ohio rivers and wetlands.



IMPACT

Our efforts in 2020 led to innovative solutions to water-quality challenges and directly shaped state and federal policy and management decisions. We finalized the revised Ohio Phosphorus Risk Index (On-Field Ohio!), an on-line tool that was incorporated into new USDA standards to guide Ohio farmers to reduce erosion and phosphorus losses. Our farmer conservation behavior research was used by the governor's office to design efficient strategies to reduce runoff into Lake Erie, and contributed to a major workshop on nitrogen held by the National Academies of Science. We also coordinated Ohio's aquatic invasive species committee, and represented the state on the NC Algal Bloom Action Team. We conducted new research and modeling to extend that work to the Ohio River watershed. We continued to provide expertise related to the local and national impacts of changes to the Clean Water Act. Our work also increased the knowledge and skills of students, managers, scientists, and stakeholders engaged in water protection. The ORWRP hosted or participated in 41 activities in 2020, engaging 1,300 Ohio State students, staff, and community members in classes, trainings, service projects, and retreats. We expanded our online outreach work, holding weekly zoom clinics for pond owners, and our Well Water Interpretation Tool was visited more than 11,000 times in 2020. Our educational programs about aquatic invasive species reached over 11,000 individuals.

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